

SNOWPACK INFLUENCES ON THE 2011 MISSOURI BASIN FLOODS



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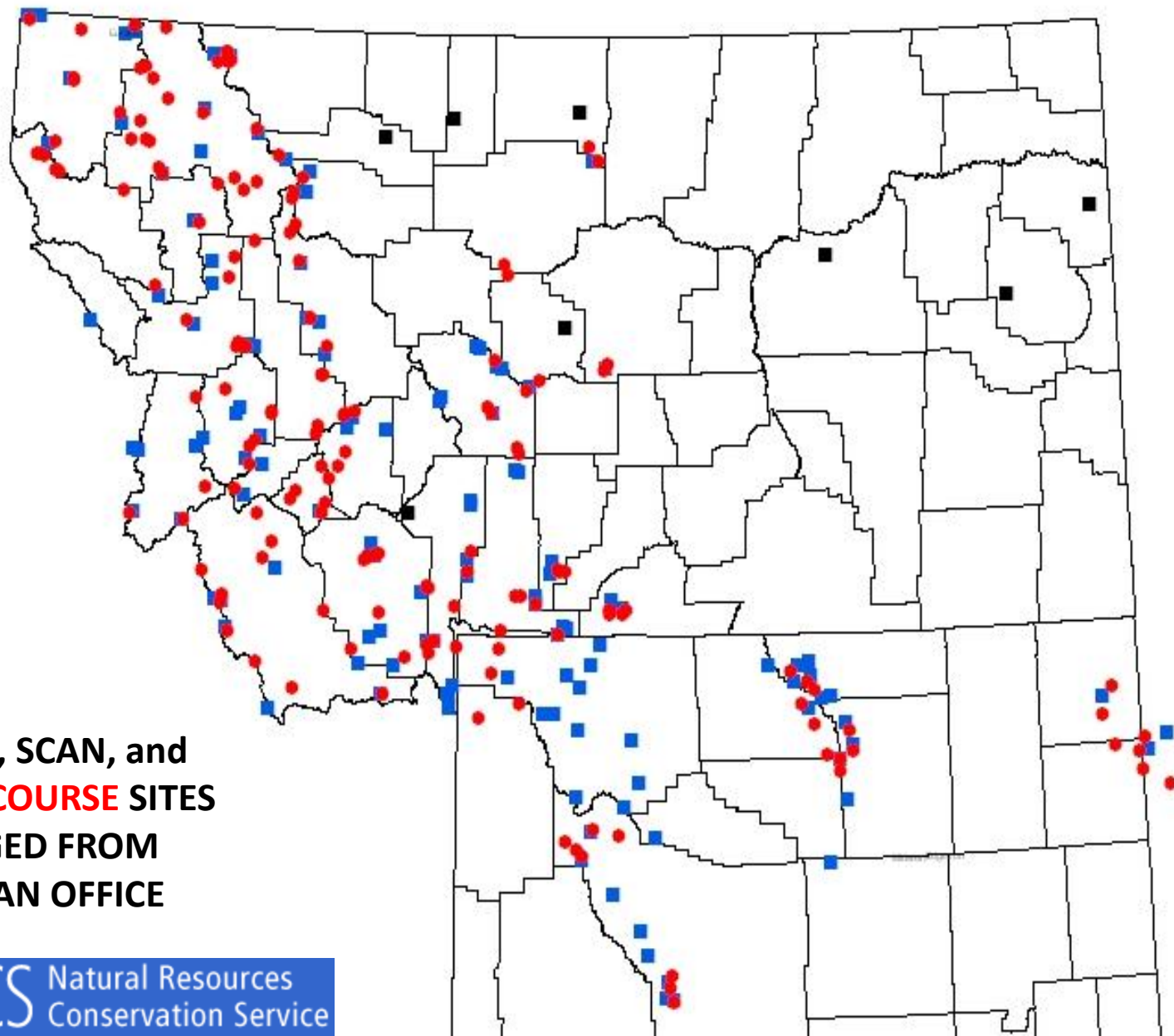
NRCS Montana Snow Survey and Water Supply Forecasting (SSWSF)

Data Collection Office Duties - Overview

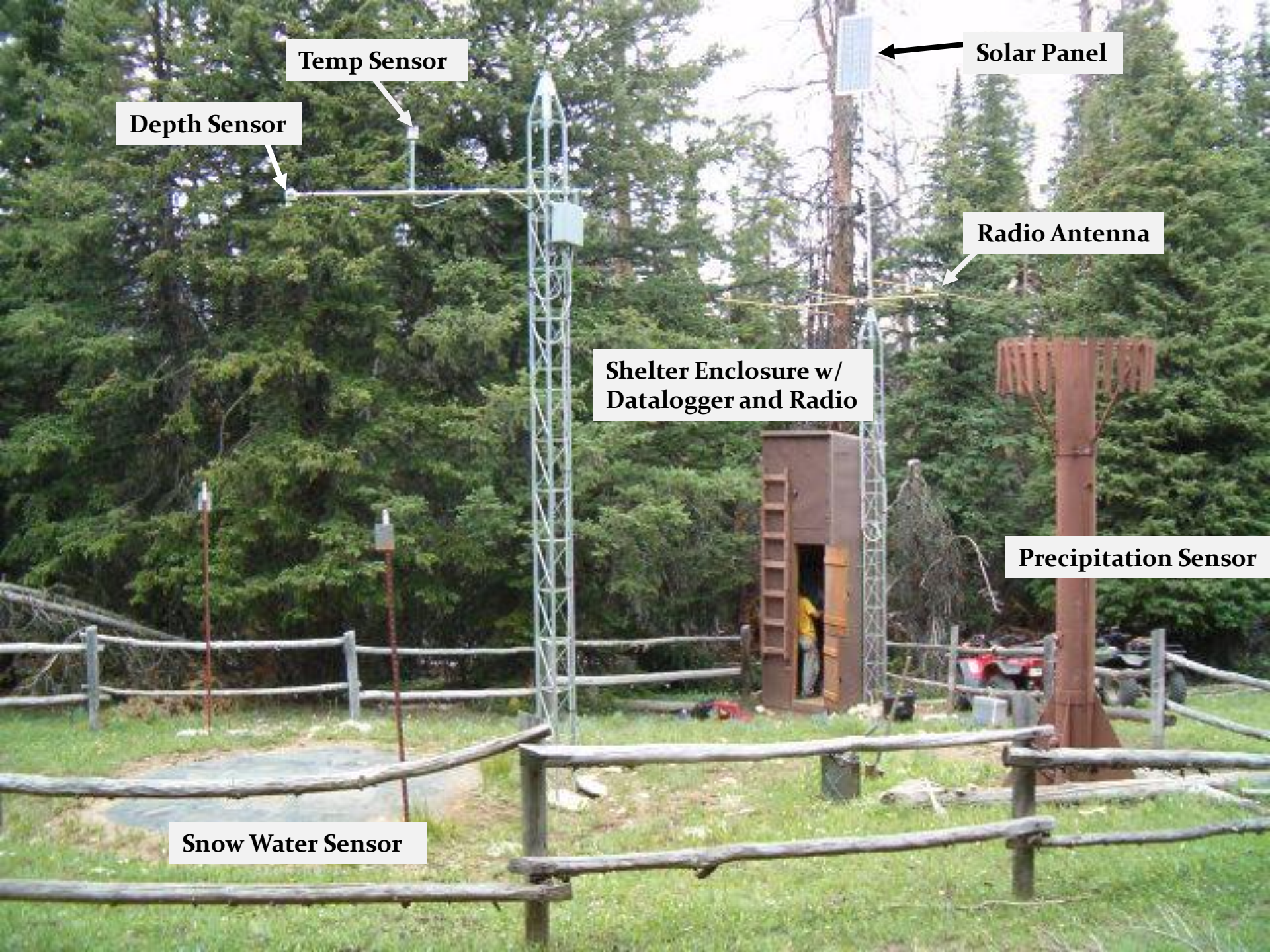
6 Fulltime staff perform the following duties:

- **Snow course data quality control and archival**
- **Snow course site maintenance**
- **SNOWpack TElemetry (SNOTEL) data quality control, review and archival**
- **SNOTEL site maintenance**
- **SNOTEL site emergency repair and equipment removal (Fire)**
- **Snow data analysis, interpretation, for water supply determinations and forecasting**
- **Snow and water supply data dissemination to users and general public**
- **Develop and release state water supply outlook reports**
- **Handle media contacts and issue state news releases**
- **Work with state and other federal entities in assessing/mitigating flood and drought conditions**

GEOGRAPHIC AREA COVERED BY NRCS MONTANA DCO



**SNOTEL, SCAN, and
SNOW COURSE SITES
MANAGED FROM
BOZEMAN OFFICE**



Temp Sensor

Depth Sensor

Solar Panel

Radio Antenna

**Shelter Enclosure w/
Datalogger and Radio**

Precipitation Sensor

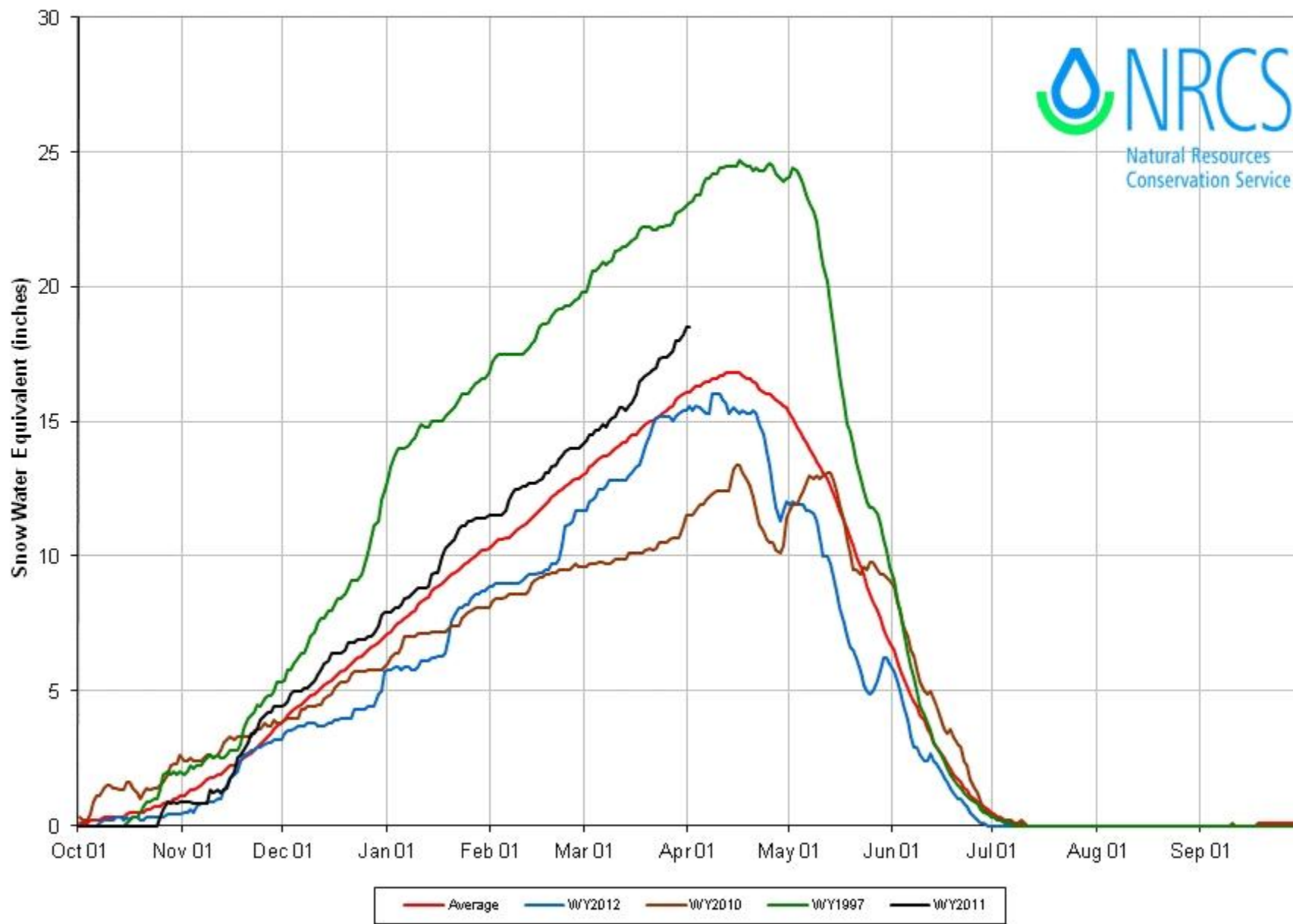
Snow Water Sensor



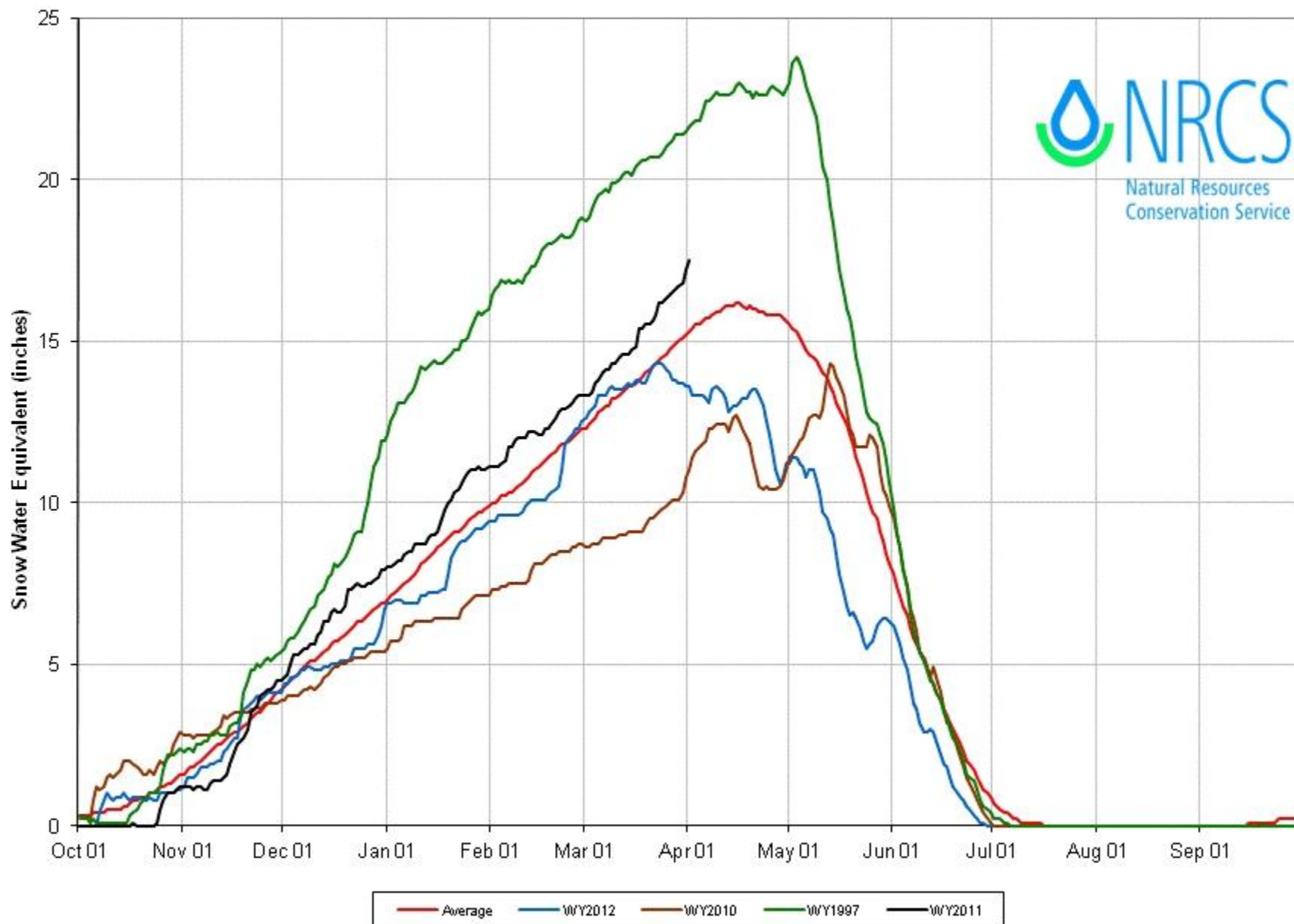
Snowpack Conditions that Developed in Spring and Early Summer 2011

- January snowpack accumulation near average in Missouri and Yellowstone River Basin mountain measurement locations (SNOTEL).
- By April, snowpack was above average in both Basins.
- In mid-May, snowpack runoff began, especially at lower elevations.
- Late May and June had below average temperatures and some snowpack increases at mid and upper elevations.
- In early June, a significant rain event at low elevations, contributed additional input to above average runoff conditions.

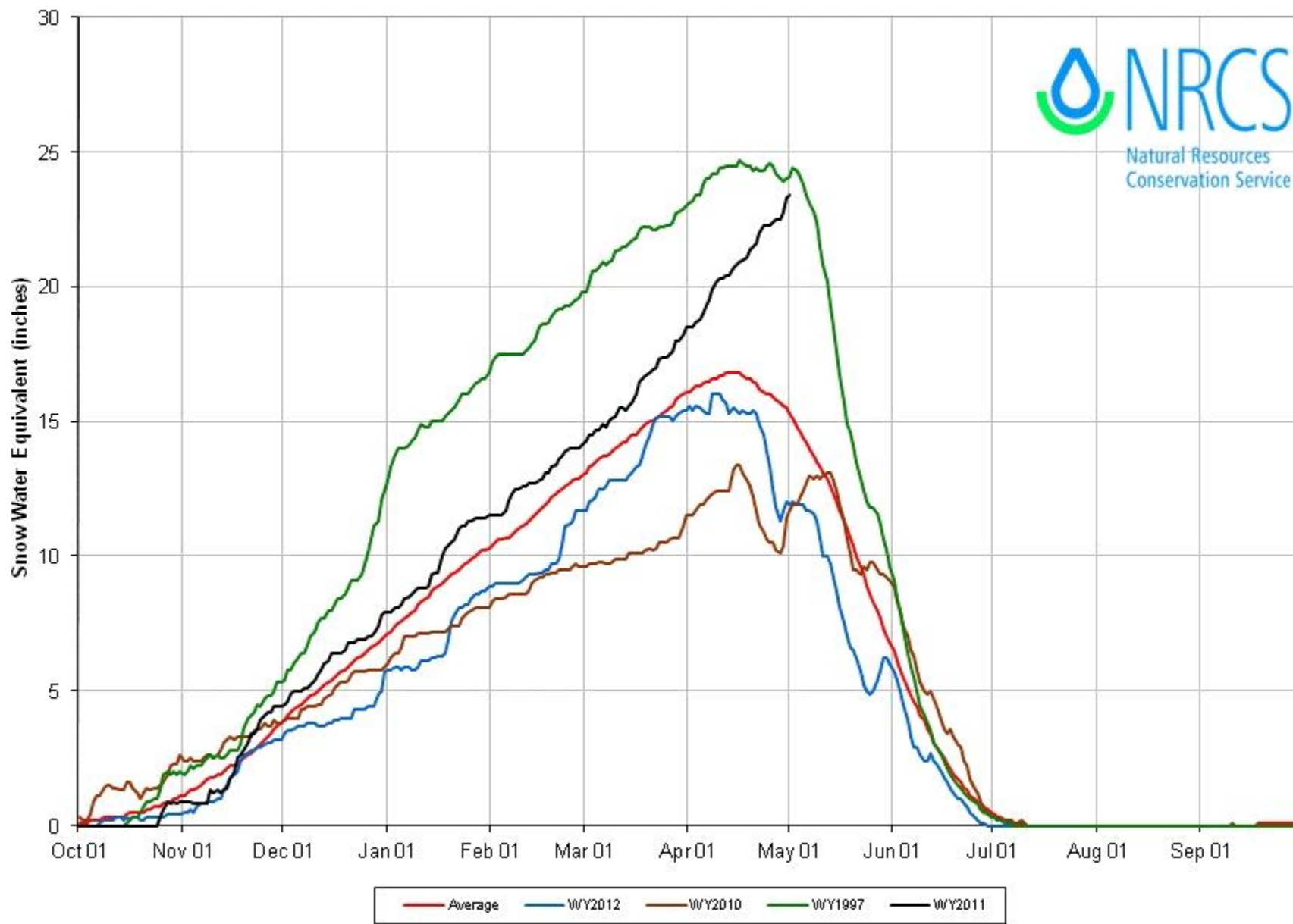
APRIL 1, 2012 Missouri River Basin Snowpack



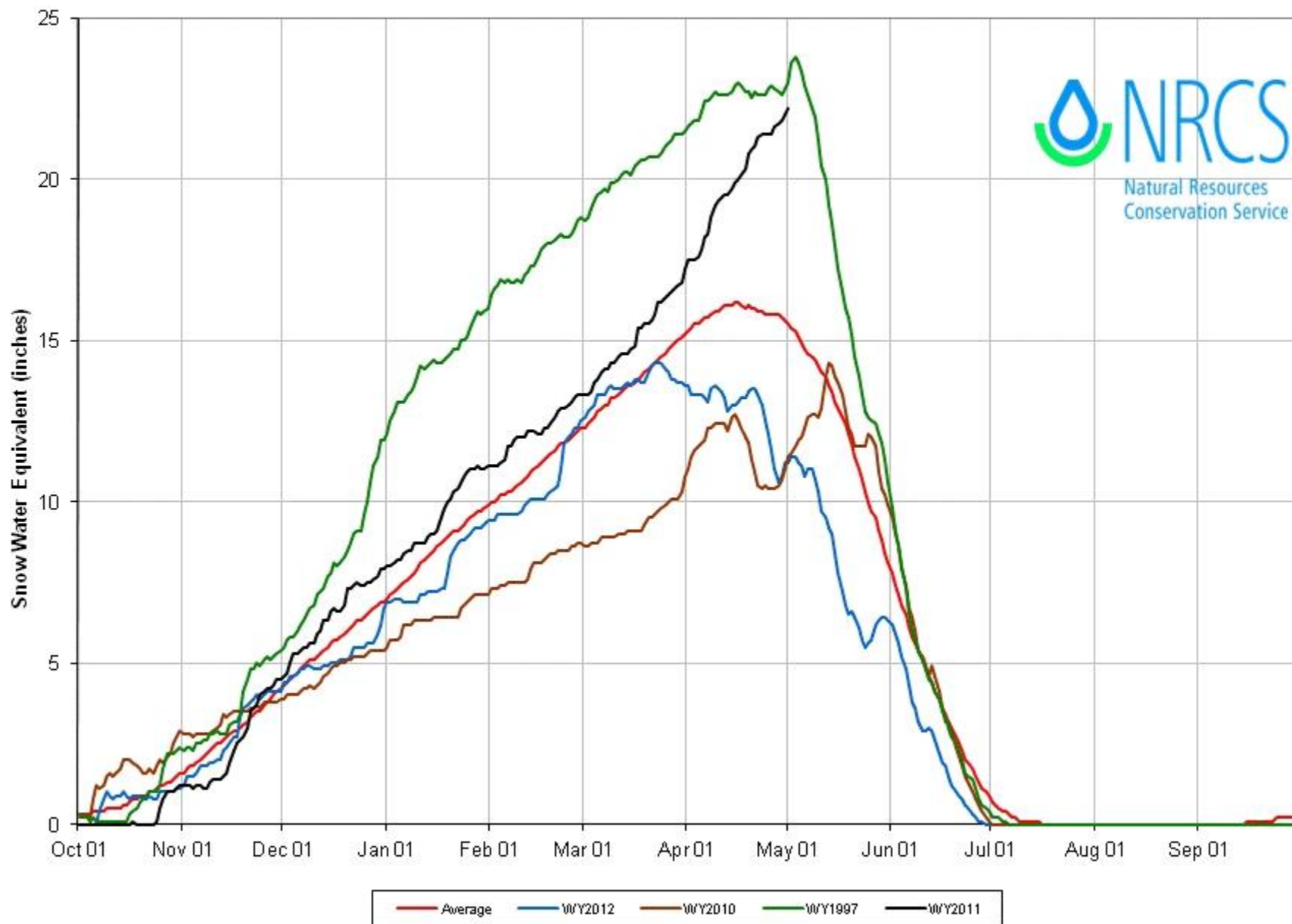
APRIL 1, 2012 Yellowstone River Basin Snowpack



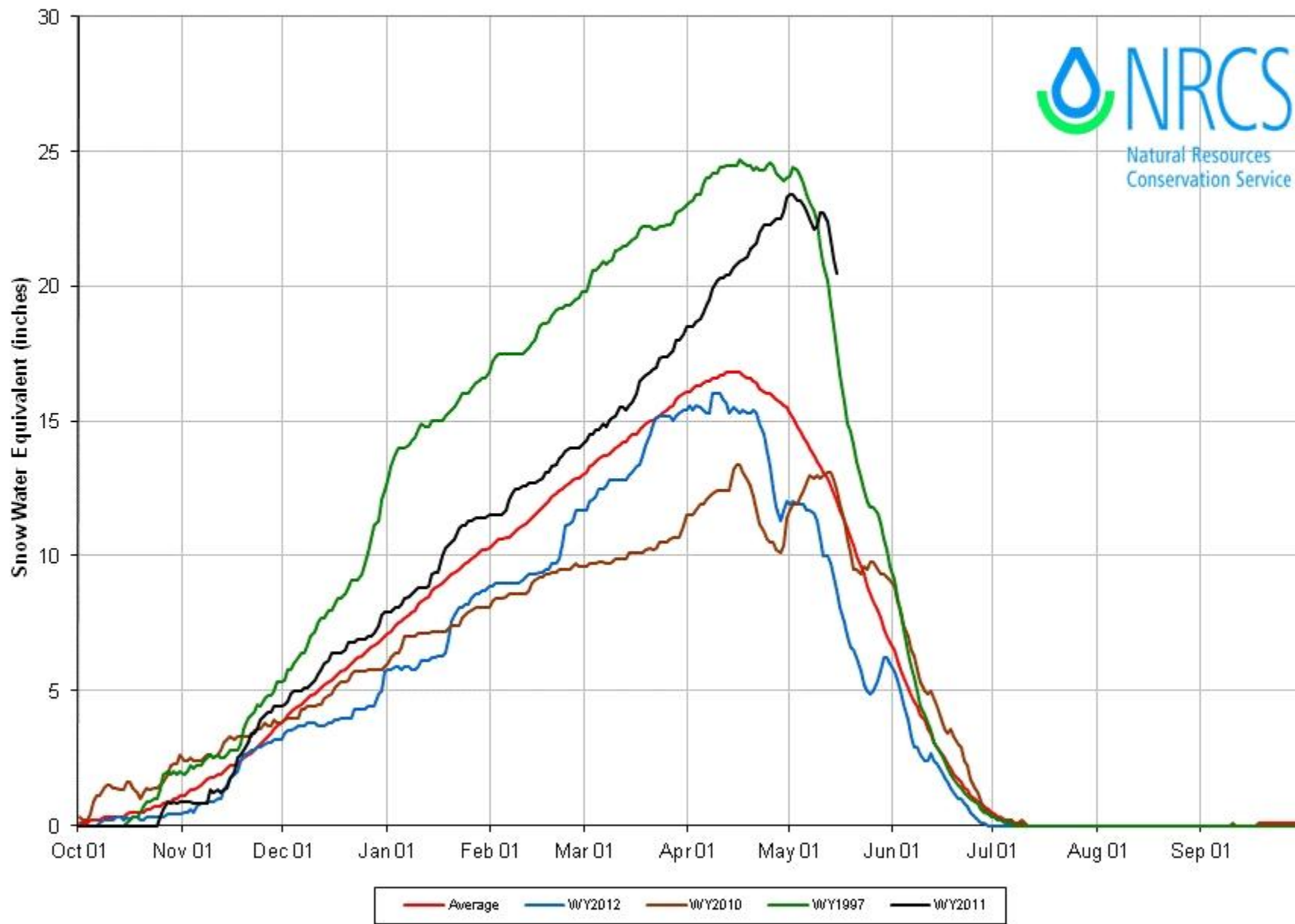
MAY 1, 2012 Missouri River Basin Snowpack



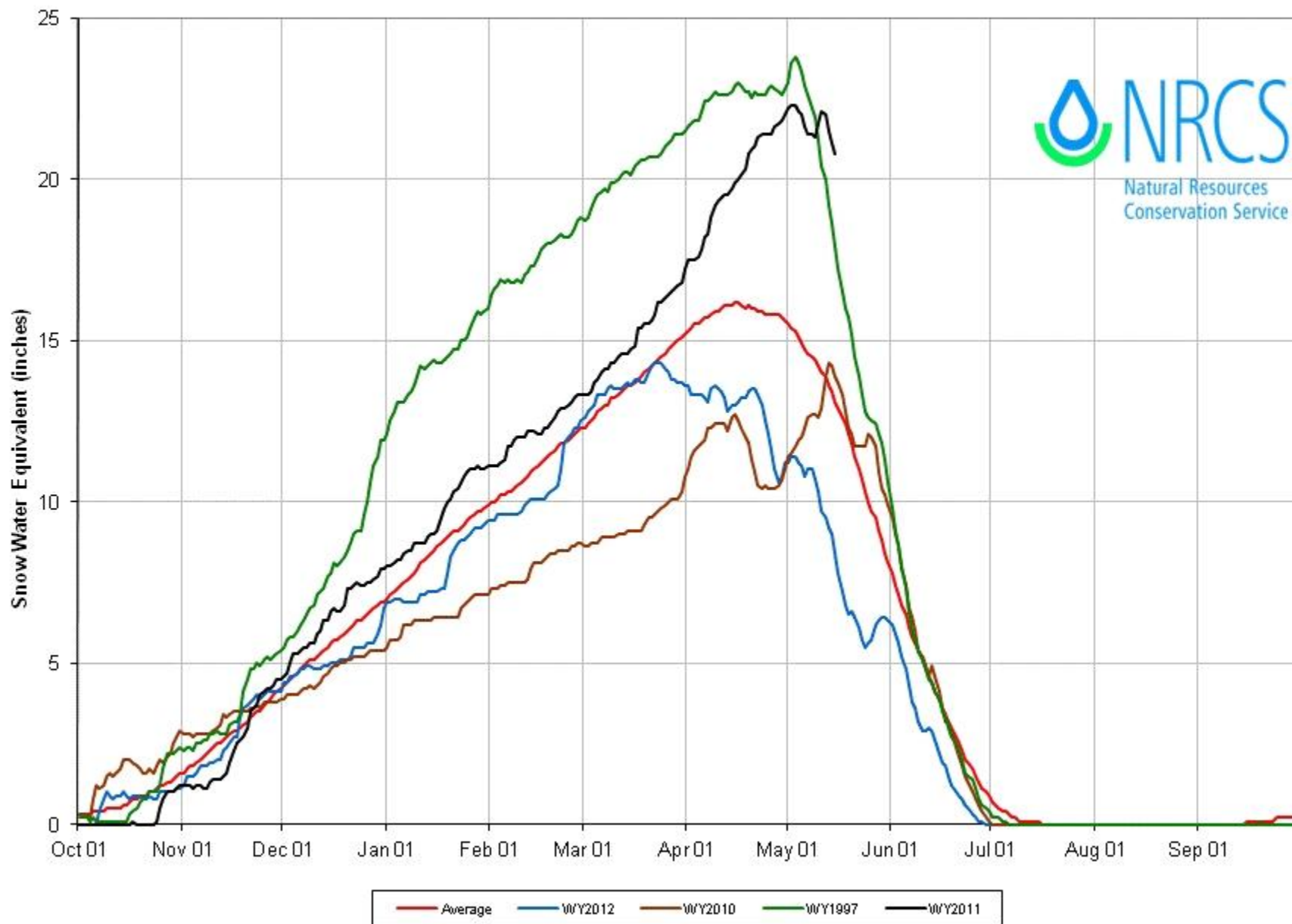
MAY 1, 2012 Yellowstone River Basin Snowpack



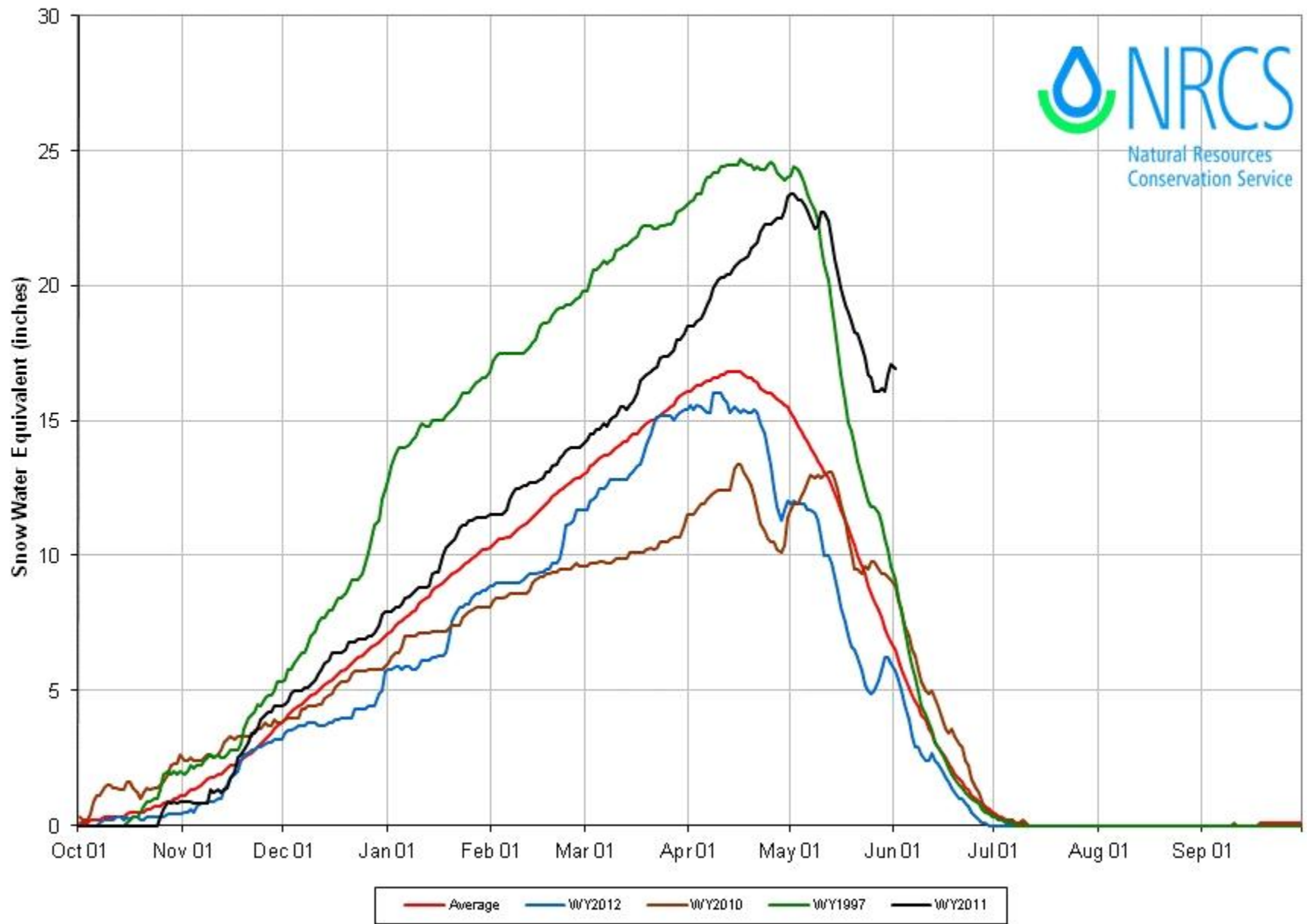
MAY 15, 2012 Missouri River Basin Snowpack



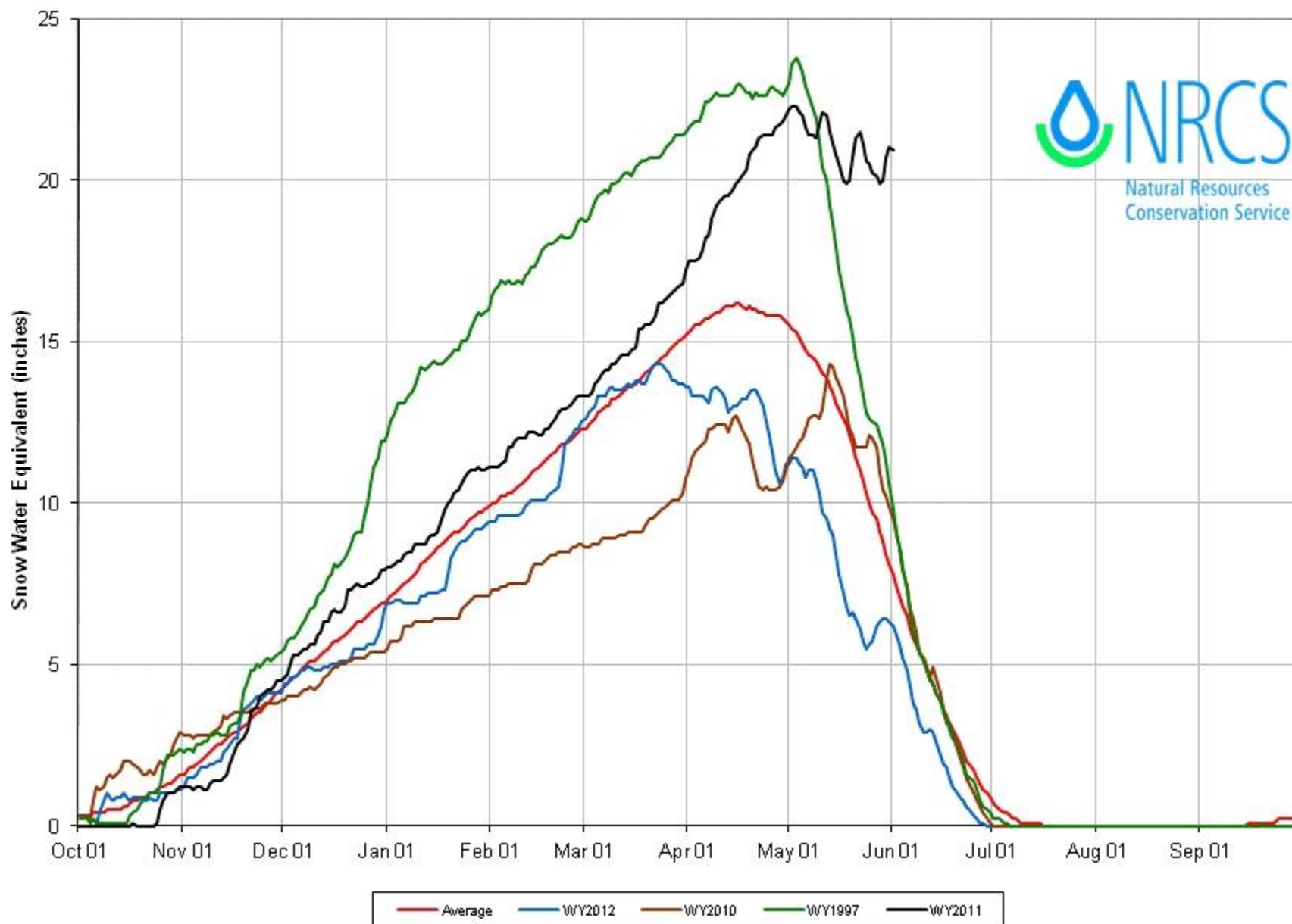
MAY 15, 2012 Yellowstone River Basin Snowpack



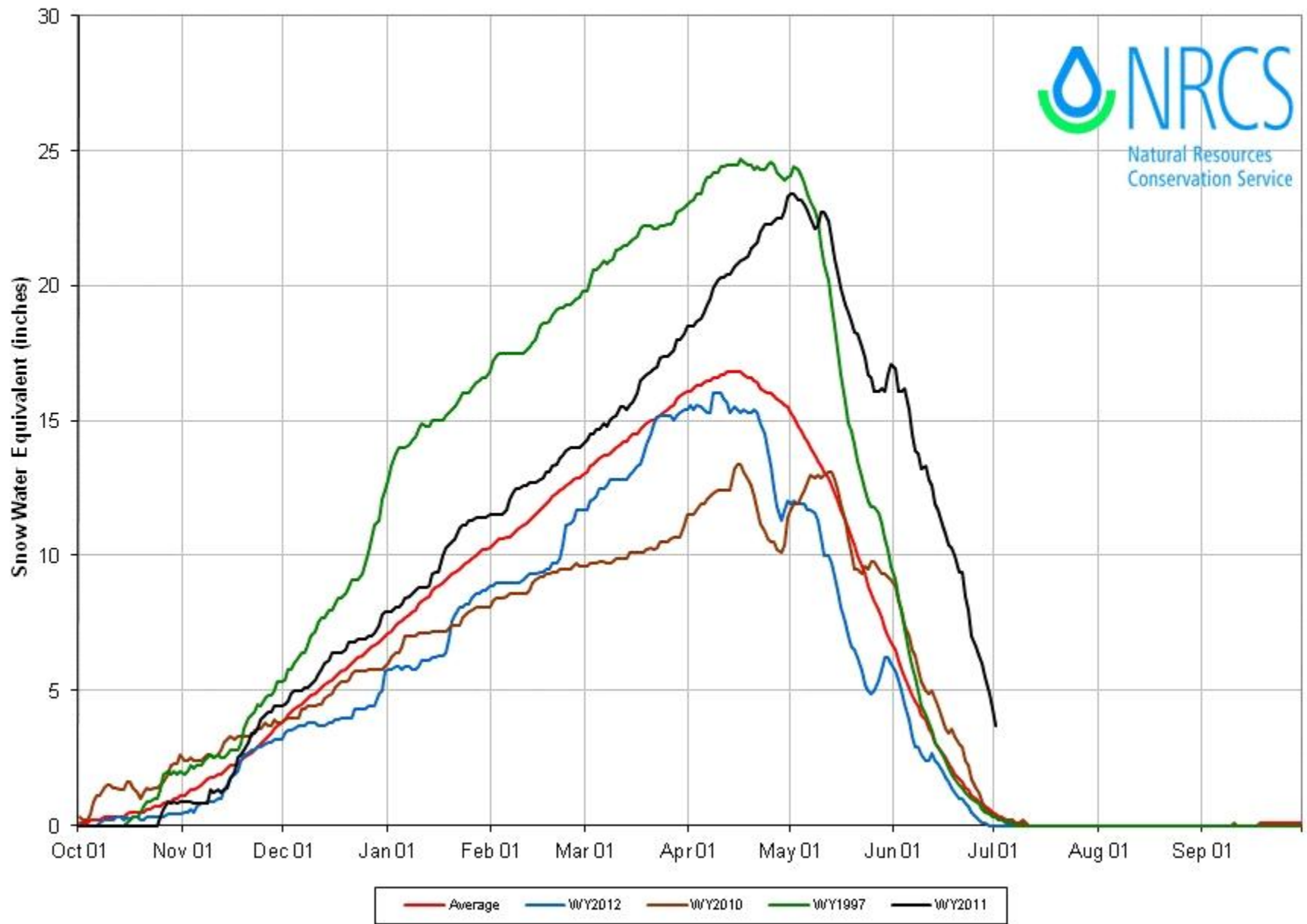
JUNE 1, 2012 Missouri River Basin Snowpack



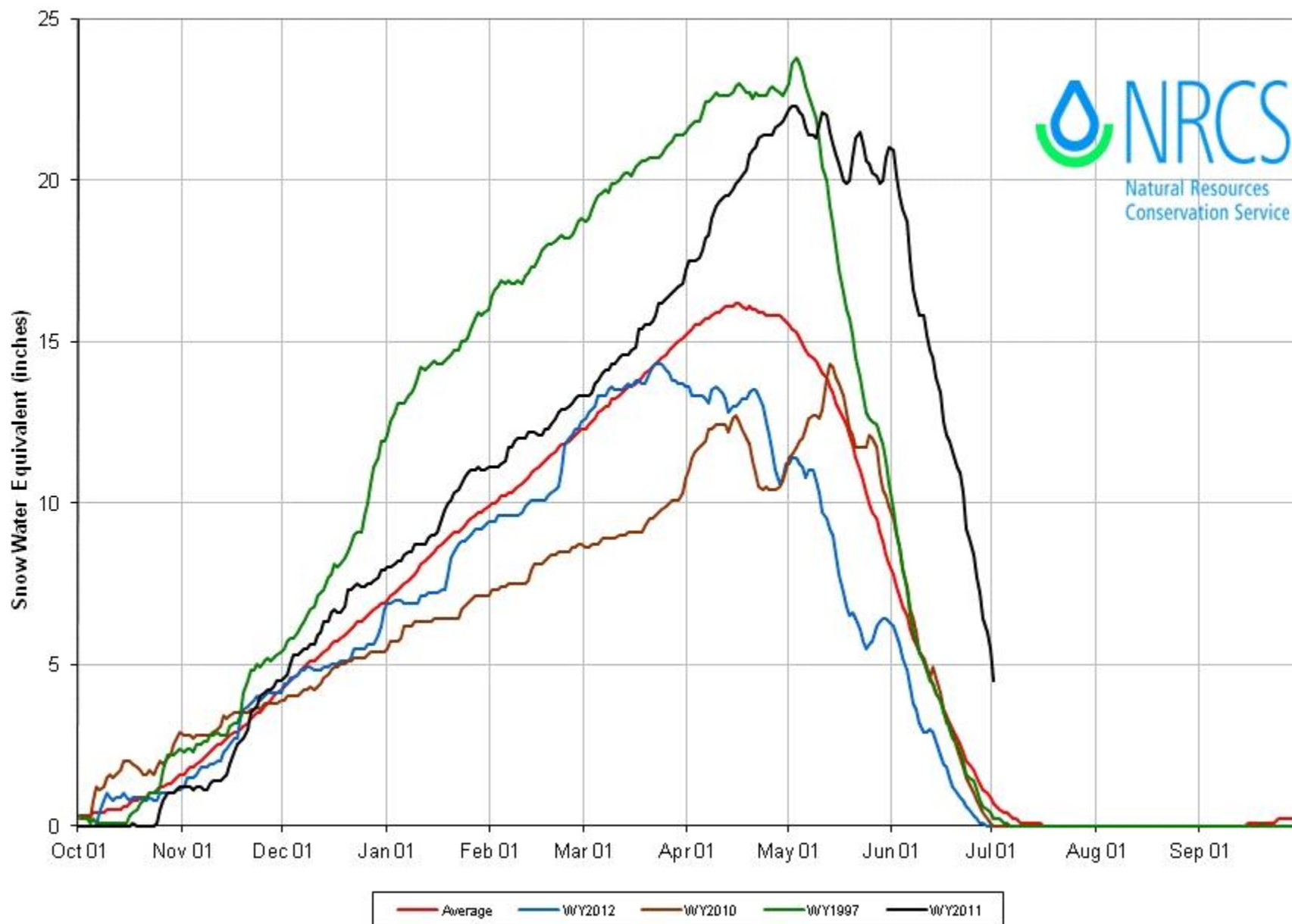
JUNE 1, 2012 Yellowstone River Basin Snowpack



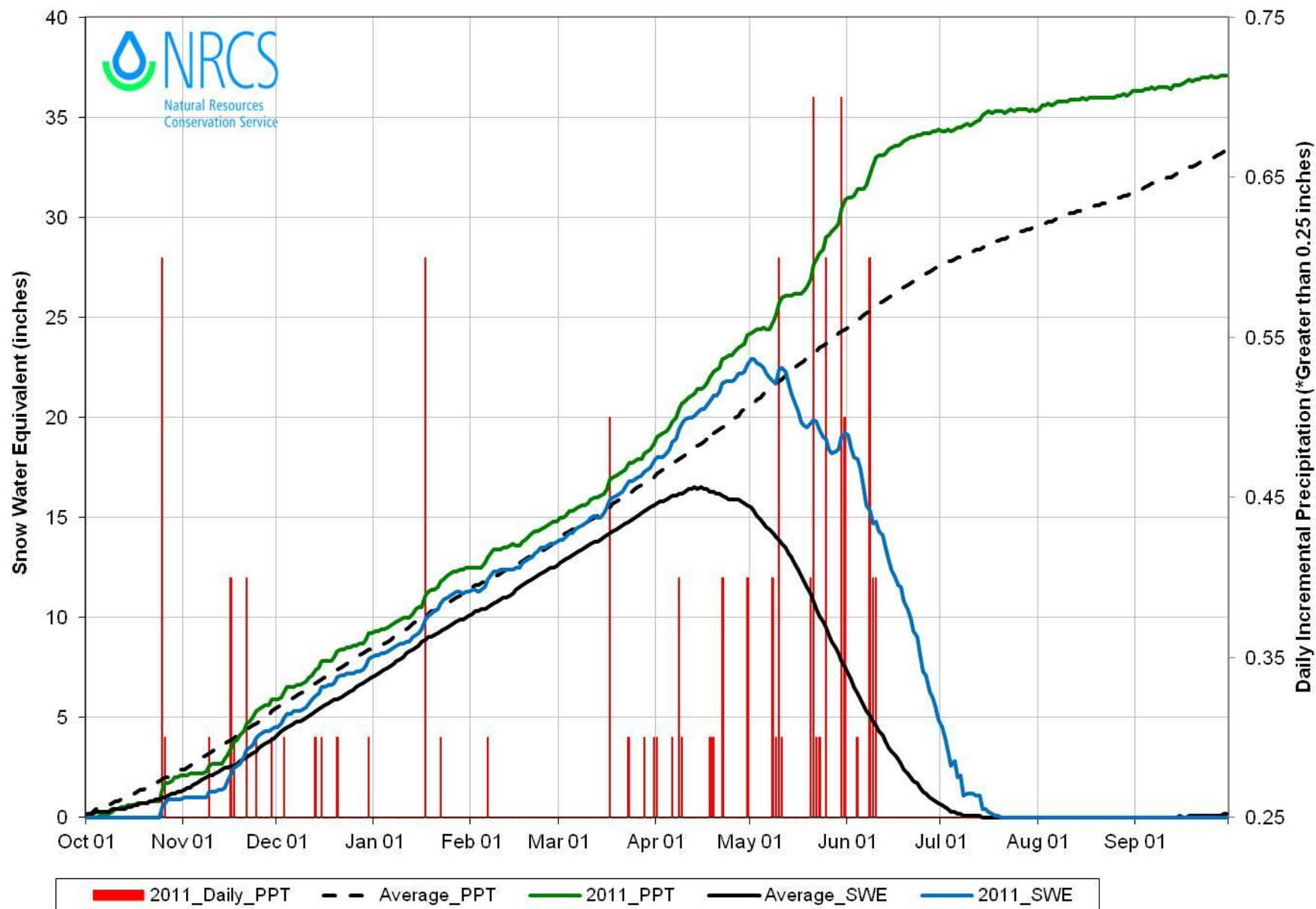
JULY 1, 2012 Missouri River Basin Snowpack



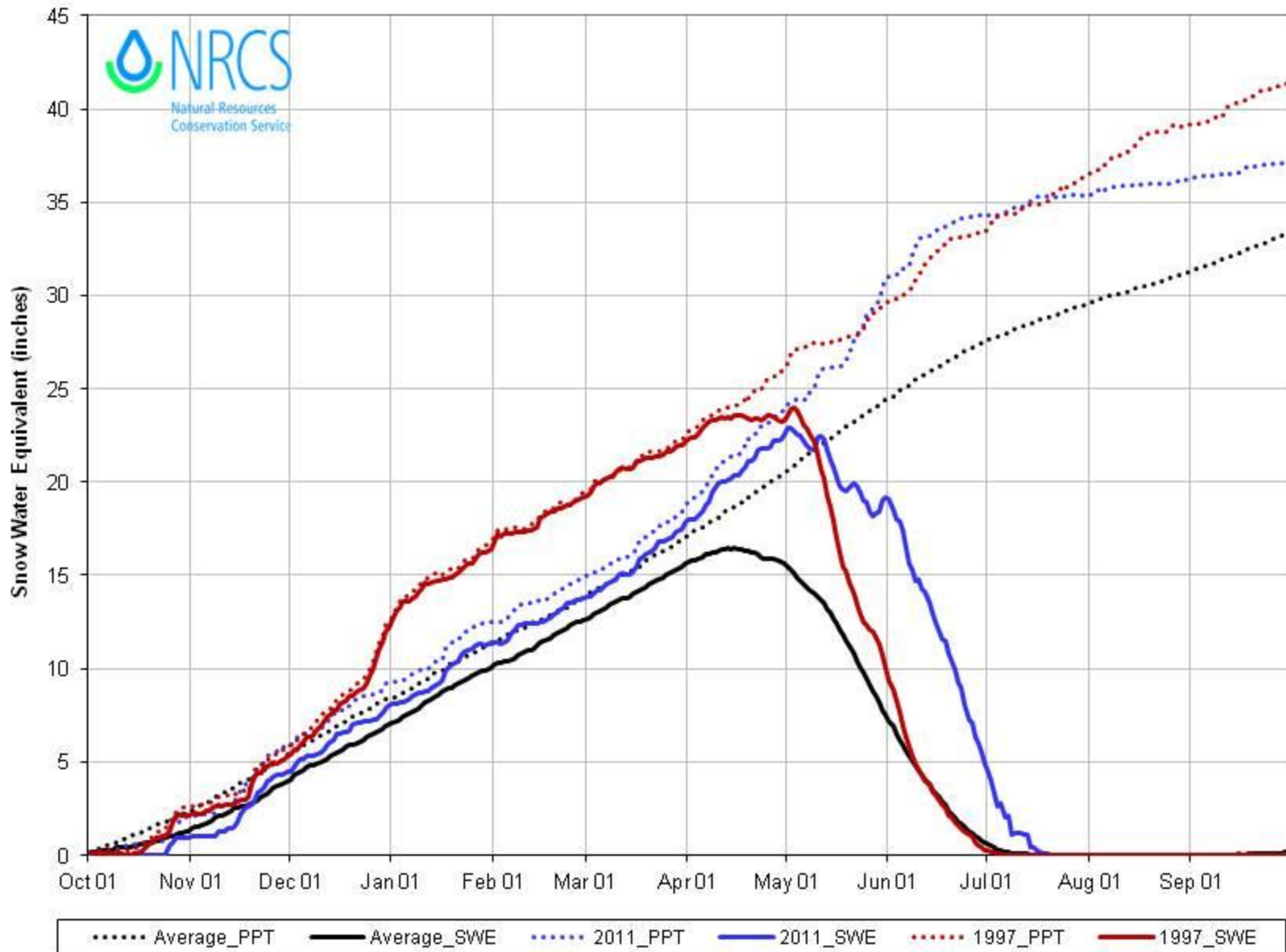
JULY 1, 2012 Yellowstone River Basin Snowpack



2011 Upper Missouri and Yellowstone Basins (above Ft. Peck and Garrison): SNOTEL Precipitation (PPT) and Snowpack (SWE) – 94 SNOTEL Stations

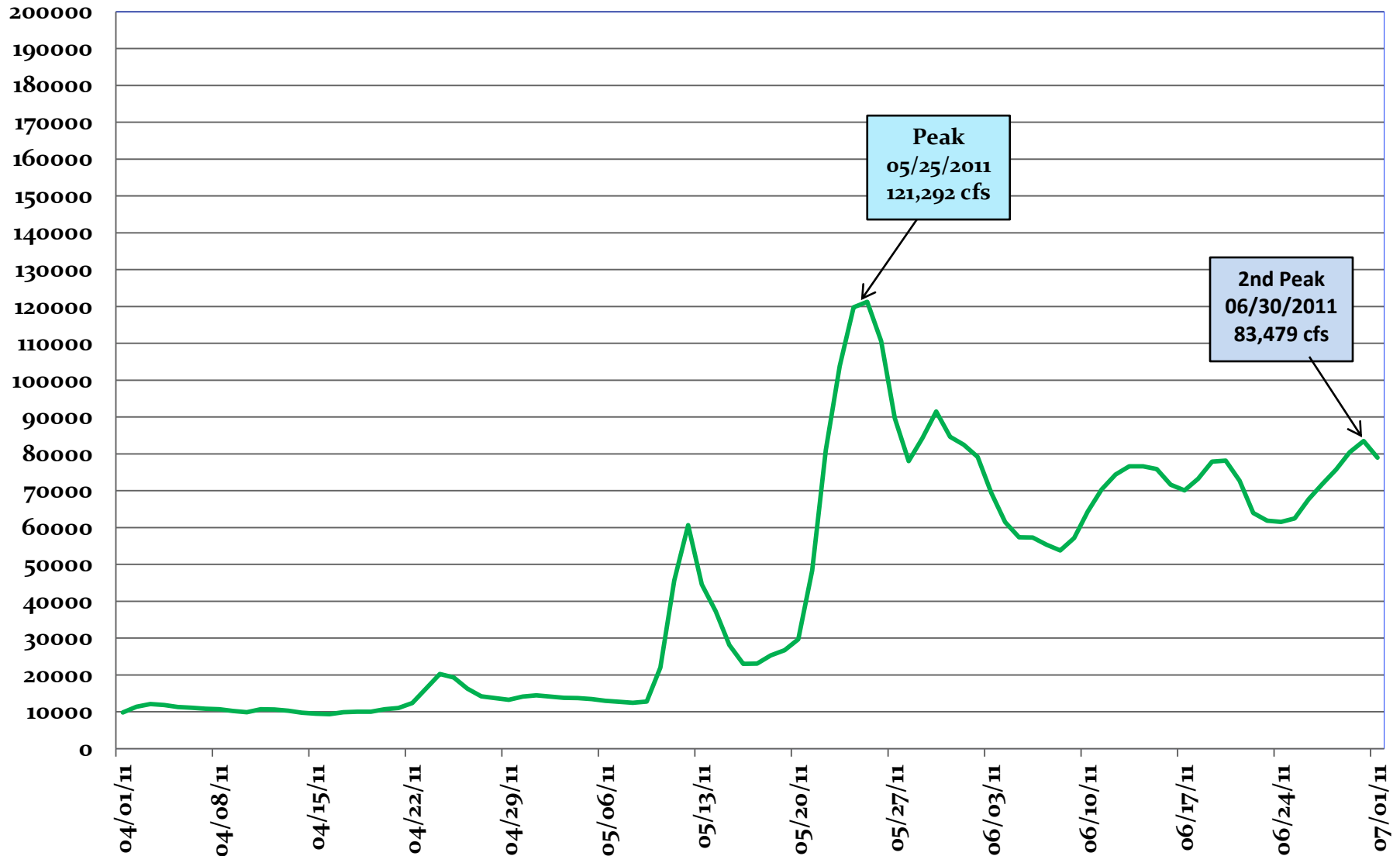


Combined Upper Missouri and Yellowstone Basins (above Ft. Peck and Garrison): Precipitation (PPT) and Snowpack (SWE) Comparison – 1997, 2011, and Average



April 1 through July 1, 2011 - Yellowstone at Sidney

— Yellowstone at Sidney Discharge cfs

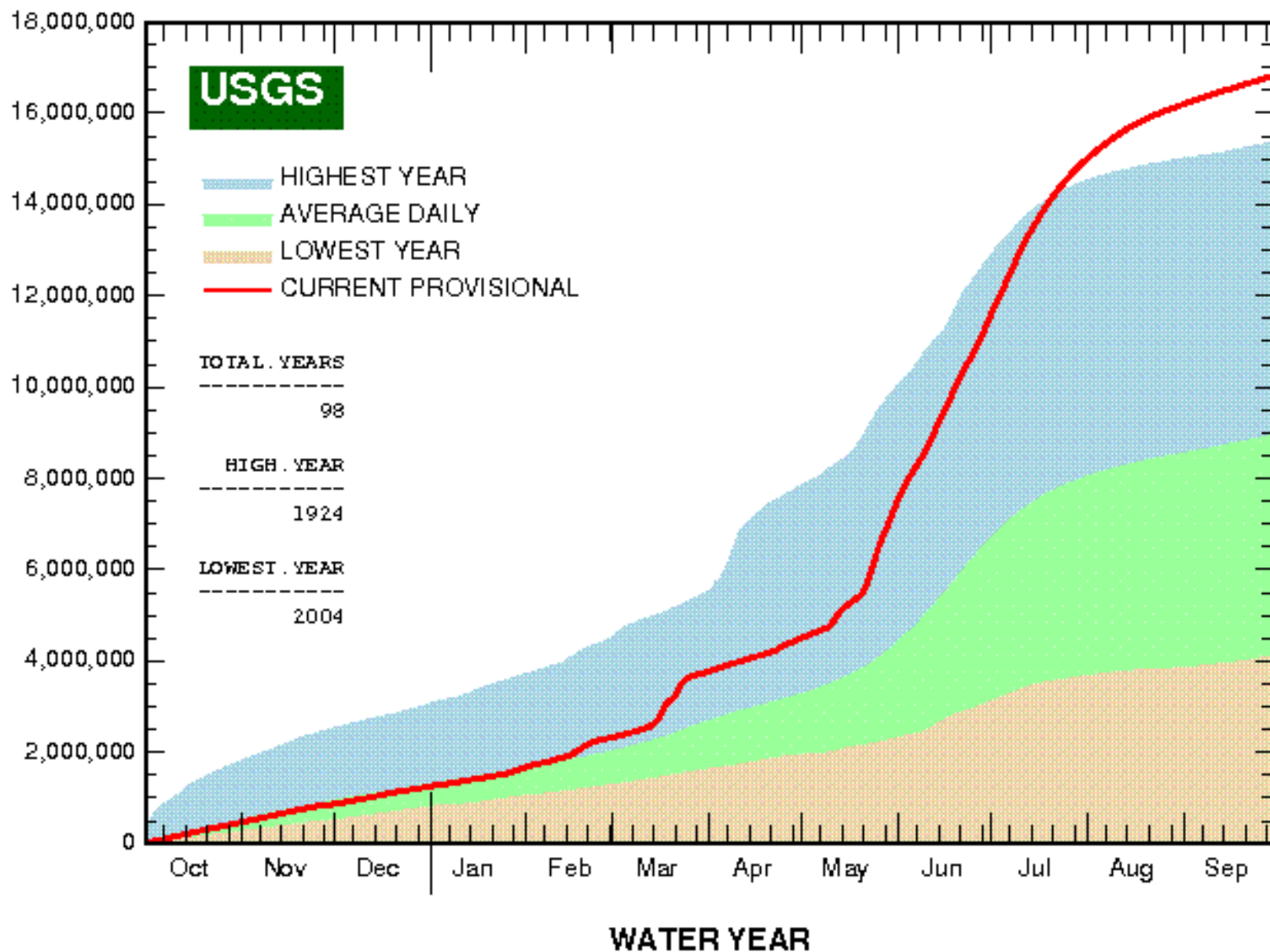


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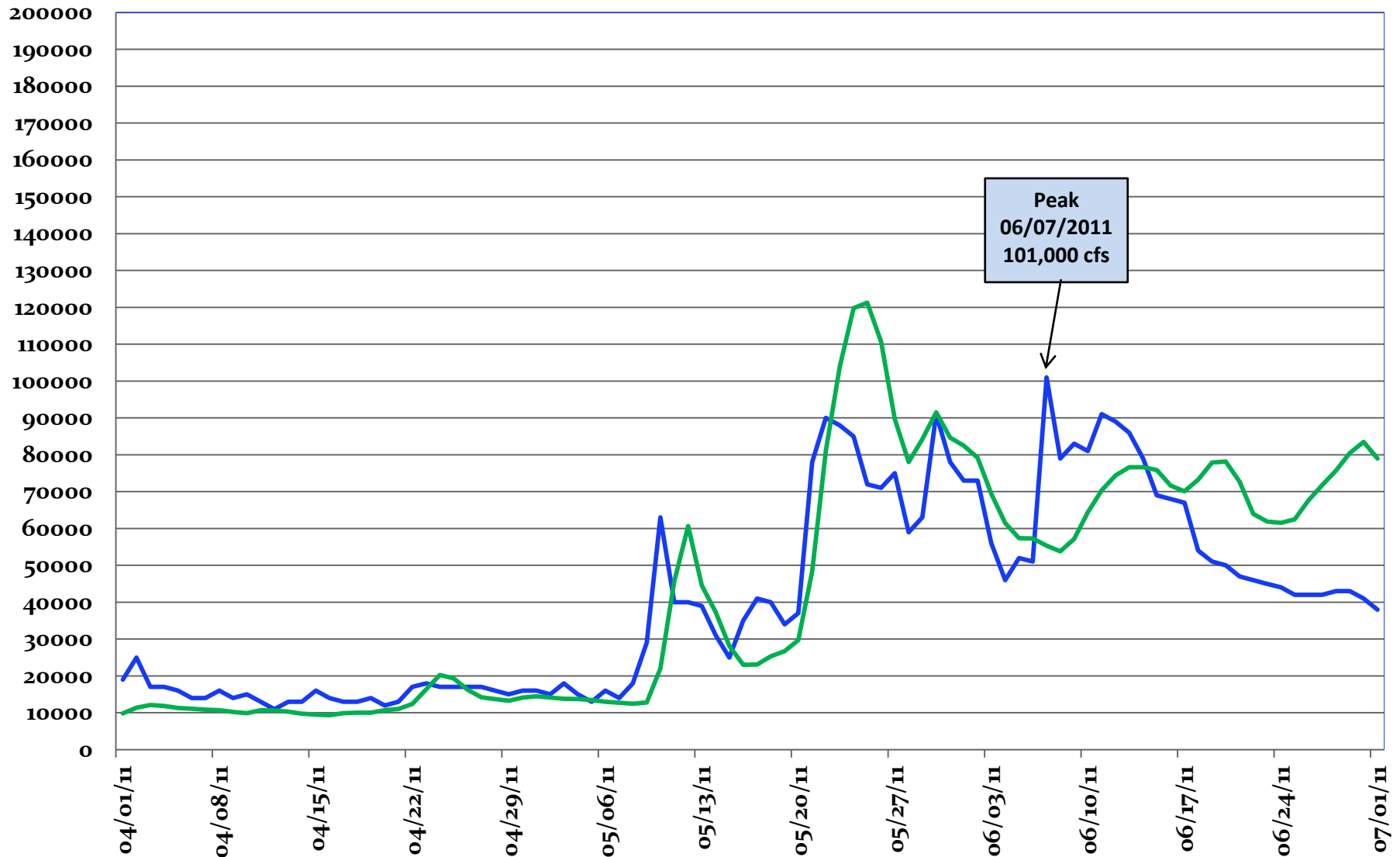


Yellowstone River near Sidney MT

April 1 - July 1, 2011 - Yellowstone at Sidney, Ft. Peck Inflow

— Fort Peck Dam-Missouri Inflow cfs

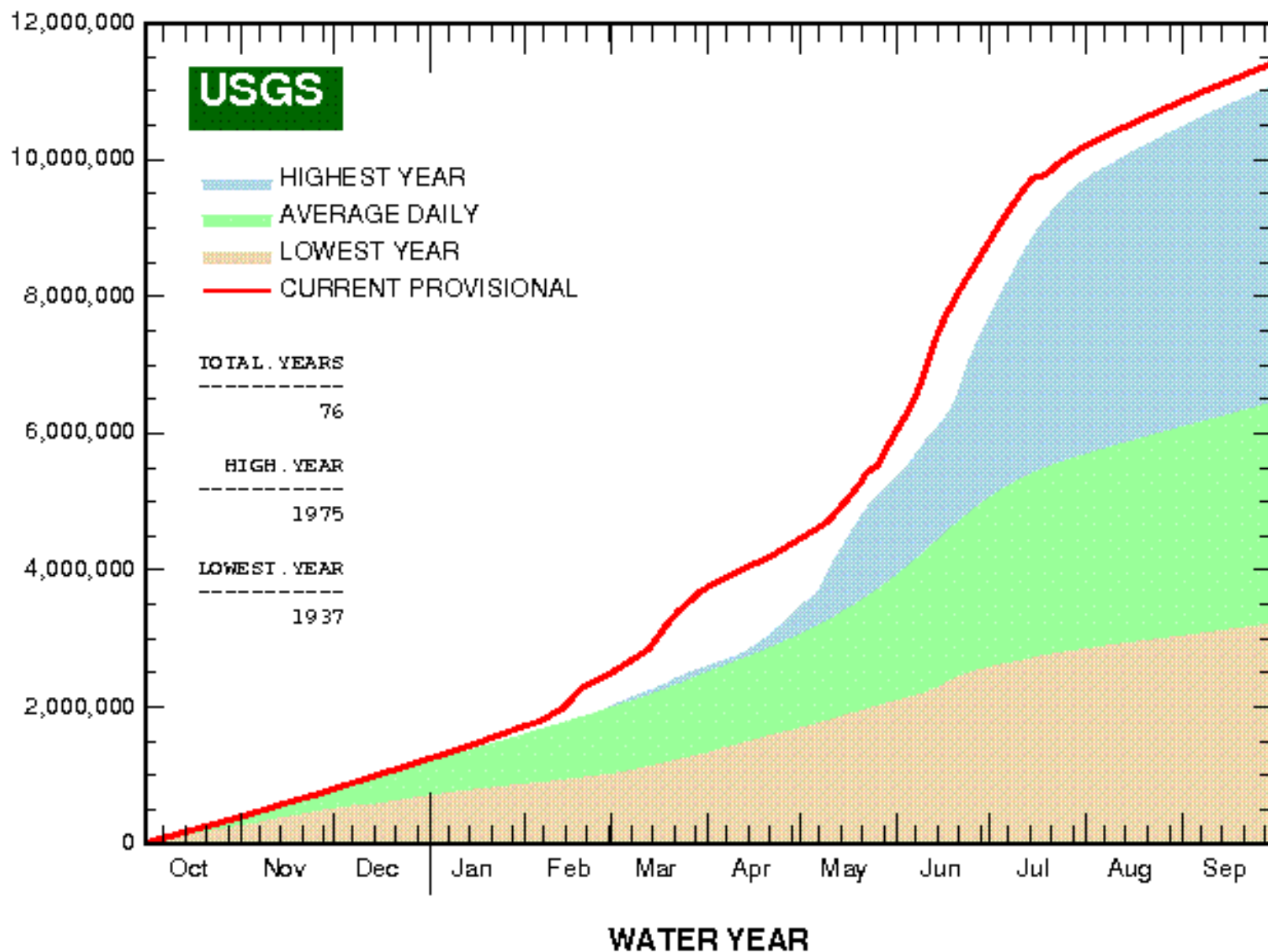
— Yellowstone at Sidney Discharge cfs



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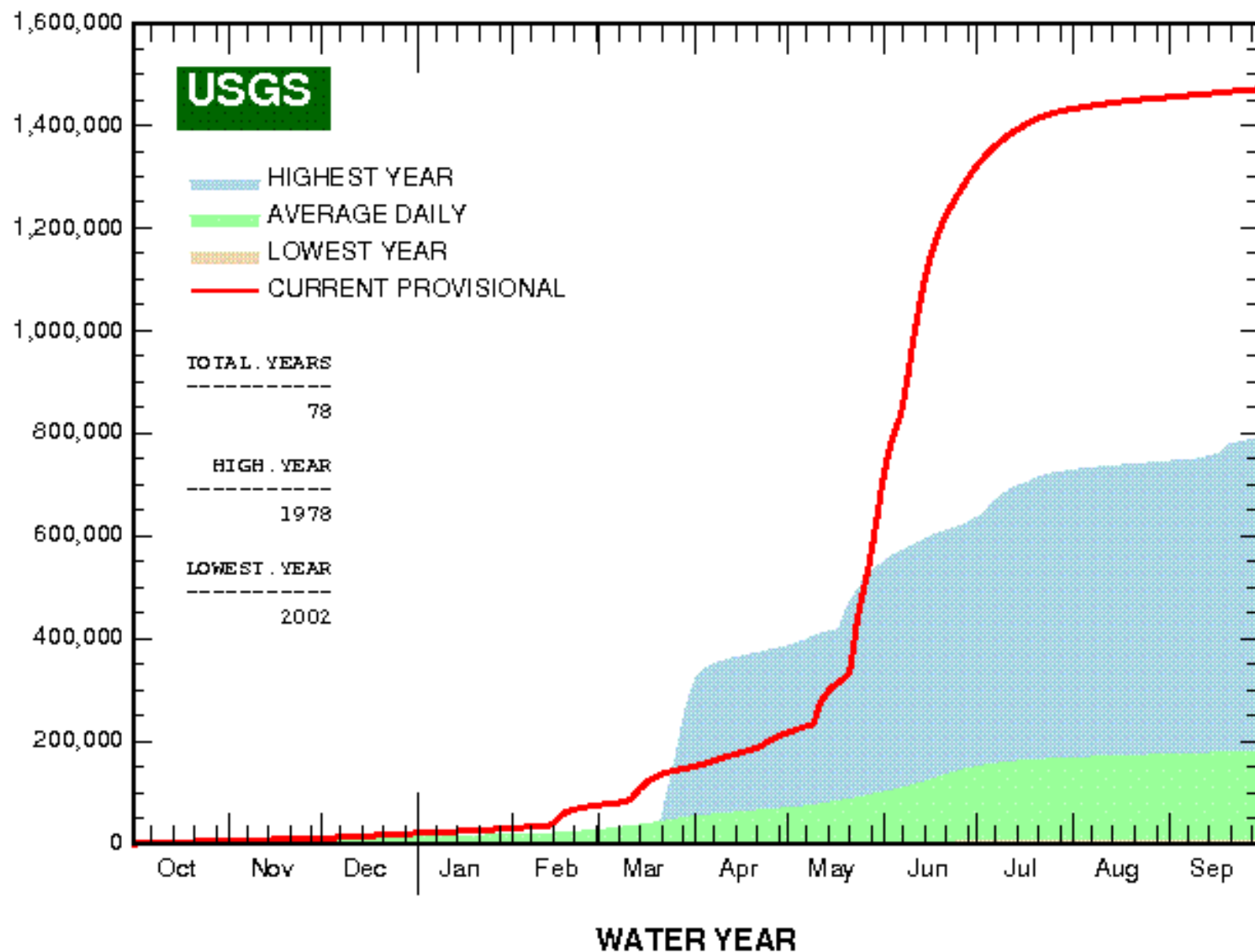


Missouri River near Landusky MT

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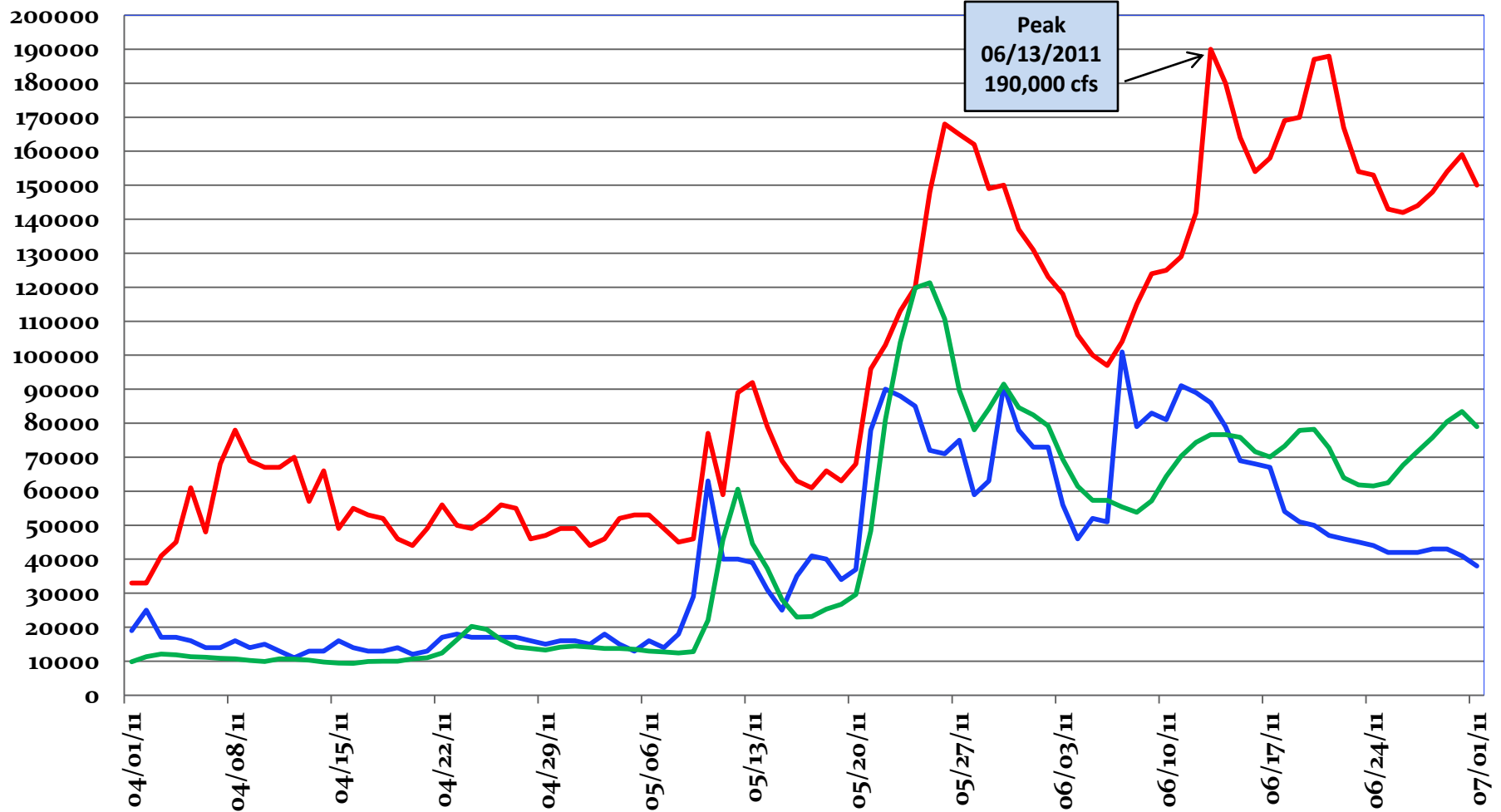
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Musselshell River at Mosby MT

April 1 - July 1, 2011 - Yellowstone at Sidney, Ft. Peck Inflow, Garrison Inflow

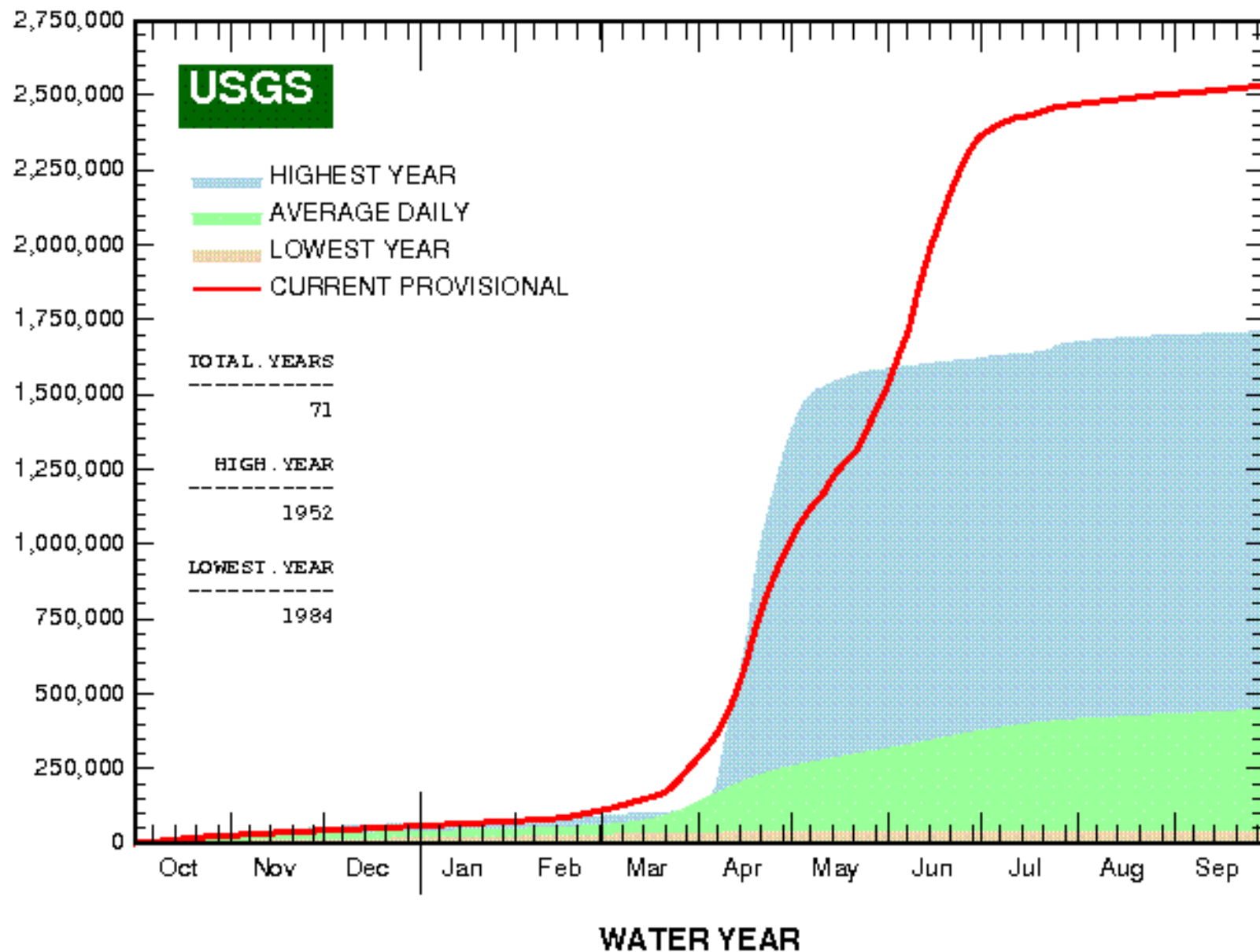
Fort Peck Dam-Missouri Inflow cfs Garrison Dam-Missouri Inflow cfs
Yellowstone at Sidney Discharge cfs



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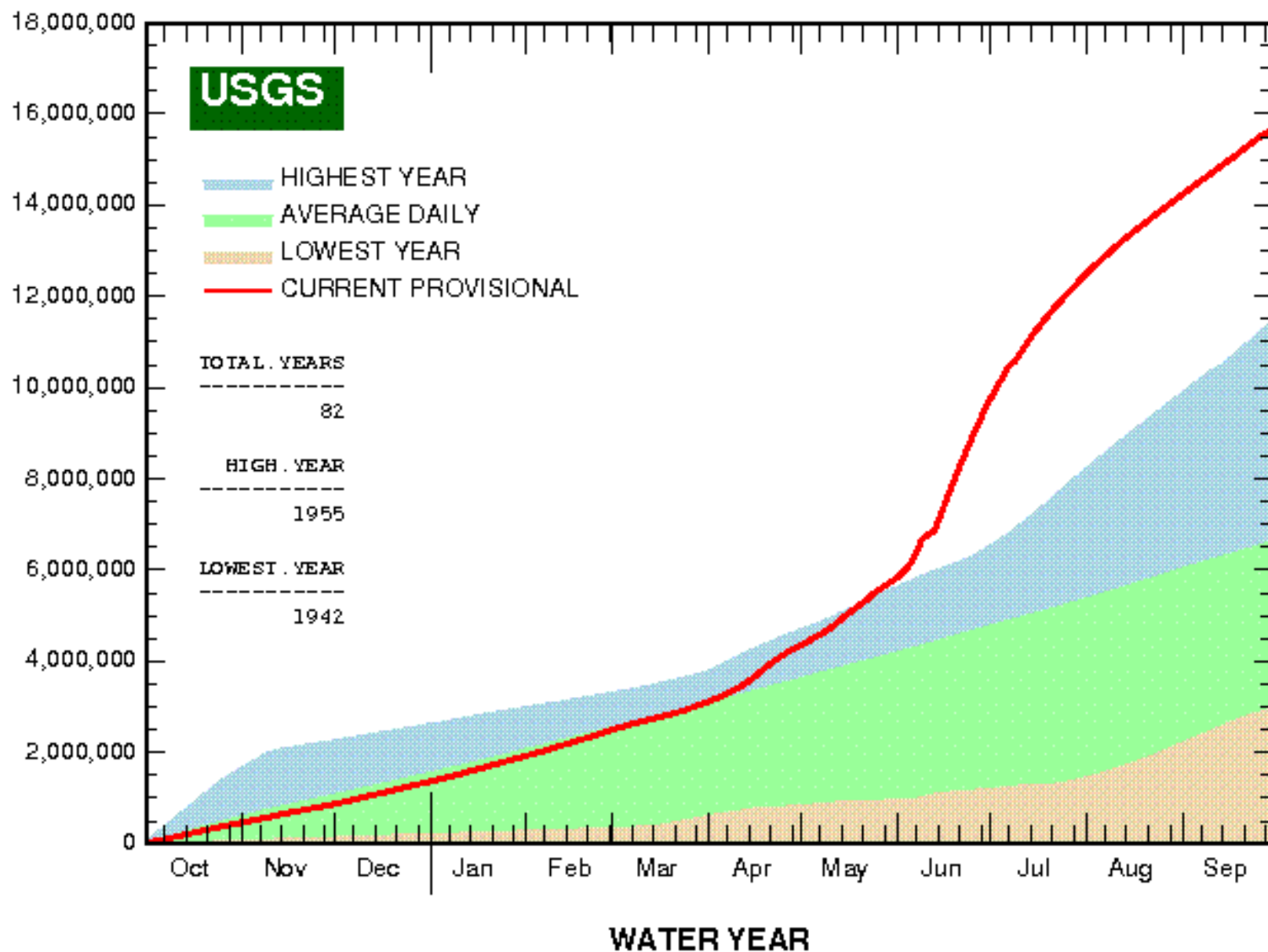
Milk River at Nashua MT

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Missouri River near Wolf Point MT

- **May through July total inflow, for both Fort Peck and local inflow to Garrison, broke the previous record.**
- **Fort Peck was 12% more than the previous record.**
- **Local inflow to Garrison was more than 60% higher than previous record.**
- **Summing Fort Peck and Garrison, the May-July total inflow, 25.4 MAF, was 41% higher than the previous record 18.0 MAF, set in 1975.**

Information and Data Courtesy U.S. Army Corps of Engineers

<http://www.nwd-mr.usace.army.mil/rcc/reports/pdfs/rcc2011summary.pdf>

Summary

- **January 1, 2011 snowpack was near average and well below 1997 values.**
- **By April 1, snowpack was above average and trending upward.**
- **May 1 snowpack was near 1997 values and was well above average.**
- **Above normal precipitation and well below average temperatures in late May and June delayed runoff well past average dates, including 1997.**
- **Significant low elevation rain added to high streamflows and existing snowpack runoff.**
- **Record inflows to the Upper Missouri River Basin reservoirs, already full, exacerbated Missouri River Basin flood conditions locally and downstream.**



QUESTIONS?

<http://www.mt.nrcs.usda.gov/snow/>

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